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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/064,254	06/26/2002	Chung-Cheng Chou	ACMP0015USA	8437

27765 7590 04/25/2003

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MERRIFIELD, VA 22116

EXAMINER

LIANG, LEONARD S

ART UNIT	PAPER NUMBER
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2853

DATE MAILED: 04/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/064,254

Applicant(s)

CHOU ET AL.

Examiner

Leonard S Liang

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because on page 4, paragraph 0030, both the nozzles and the orifice layer are both referred to using reference 120 and on page 5, paragraph 0031, the completed droplet and tail of droplet are both referred to by reference 146. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 334d. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 21-25, 130, 148, 520, 916, and 934. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

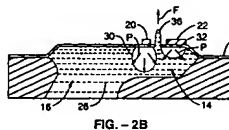
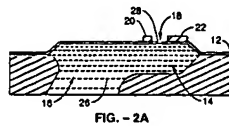
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al (WO 9937486) in view of Lee et al (US Pat 6460961).

Kim et al discloses:

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- {claim 1} A jet in flow communications with a reservoir (figure 2A); a substrate (figure 2A) having a manifold (figure 2A, reference 16) for receiving fluid from the reservoir; an orifice layer (figure 2A, reference 12) disposed above a substrate so that a plurality of chambers (figure 2A, reference 14; pages 1-3) are formed between the orifice layer and the substrate; a plurality of nozzles that are disposed on the orifice layer and correspond to the plurality of chambers for ejecting the fluid in the chambers so as to form a plurality of droplets (figure 2A, reference 18; pages 1-3; plurality of nozzles and droplets naturally suggested); an orifice (figure 2A, reference 18)



- {claim 2} an interval between the manifold and the first side is less than an interval between the manifold and the second side (figure 2A)
- {claim 3} the first bubble is used as a virtual valve for restricting fluid between the first bubble and the second bubble to avoid flowing to the manifold when the second bubble is generated (page 9, lines 11-12)
- {claim 4} each of the bubble generators is a heater, the driving circuit drives the heater(s) disposed at the first side to heat fluid in the corresponding chamber so as to generate the first bubble, and the driving circuit drives the heater(s) disposed at the second side to heat fluid in the corresponding chamber so as to generate the second bubble (figure 2A, reference 20, 22, 30, 32; page 8, lines 6-18)
- {claim 5} an interval between the manifold and the first side is less than an interval between the manifold and the second side (as taught in claim 2)

- {claim 6} the first bubble is used as a virtual valve for restricting fluid between the first bubble and the second bubble to avoid flowing to the manifold when the second bubble is generated (as taught in claim 3)
- {claim 7} there is at least one heater disposed at the first side and connected in series to one of the heater(s) disposed at the second side wherein resistance of the heater disposed at the first side is greater than resistance of the heater disposed at the second side (figure 2A; page 8, lines 6-8)
- {claim 14} the droplets are ejected from the orifice along an ejection direction, and the bubble generators are disposed in parallel at the first side and the second side (figure 2A)
- {claim 15} the bubble generator(s) disposed at the first side are arranged along a first straight line, the bubble generator(s) disposed at the second side are arranged along a second straight line, and the first straight line is parallel to the second straight line (figure 2A)
- {claim 16} A jet in flow communication with a reservoir (figure 2A); an orifice disposed above the reservoir (figure 2A, reference 18); a first bubble generator group disposed at a first side of the orifice for generating a first bubble in the reservoir, the first bubble is used as a virtual valve to restrict fluid flowing to the manifold (figure 2A, reference 20; valve as taught in claim 3); a second bubble generator group disposed at a second side of the orifice for generating a second in the reservoir, the second bubble squeezing fluid between the first bubble and the second bubble out of the orifice to form a droplet (figure 2A, reference 32); wherein the first bubble generator group or the second bubble generator group comprises at least two independently drivable bubble generators for generating the first bubble or the second bubble (figure 2A, reference 20, 22)
- {claim 17} each of the bubble generators is a heater (figure 2A, reference 20, 22)

Kim et al differs from the claimed invention in that it does not disclose:

- {claim 1} at least three bubble generators electrically connected to a driving circuit and disposed at a first side of the orifice and a second side of the orifice,

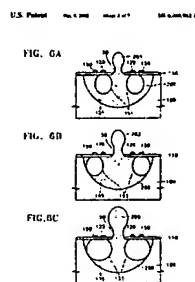
at least two of the bubble generators disposed at one of either the first side or the second side, and at least one of the bubble generators disposed at the other of the first side and the second side, the driving circuit driving the bubble generator(s) disposed at the first side to generate a first bubble in a corresponding chamber and driving the bubble generator(s) disposed at the second side to generate a second bubble in the corresponding chamber; wherein the driving circuit drives the bubble generators selectively so that each of the nozzles is capable of ejecting droplets of different sizes

- {claim 8} each of the heater(s) disposed at the first side connects in series to one of the heater(s) disposed at the second side
- {claim 9} at least two heaters are disposed at the first side, and each of the nozzles comprises a leading wire for connecting one of the heater(s) disposed at the second side with the heaters disposed at the first side, and the drawing circuit applies a voltage on at least one of the heaters disposed at the first side to generate the first bubble and the second bubble simultaneously
- {claim 10} at least two heaters are disposed at the second side, and each of the nozzles comprises a leading wire for connecting one of the heater(s) disposed at the first side with the heaters disposed at the second side and the driving circuit applies a voltage on at least one of the heaters disposed at the second side to generate the first bubble and the second bubble simultaneously
- {claim 11} there is at least one heater disposed at the first side connected in parallel to one of the heater(s) disposed at the second side, wherein a resistance of the heater disposed at the first side is less than a resistance of the heater disposed at the second side
- {claim 12} the orifice layer comprises at least two structure layers arranged in parallel, and there is at least one heater disposed on each of the structure layers
- {claim 13} the droplets are ejected from the orifice along an ejection direction, and at least two of the heaters are disposed on the two structure layers linearly along the ejection direction

- {claim 18} an interval between the orifice and one of the two bubble generators is different from an interval between the orifice and the other one of the two bubble generators

Lee et al discloses:

- {claim 1} at least three bubble generators electrically connected to a driving circuit and disposed at a first side of the orifice and a second side of the orifice, at least two of the bubble generators disposed at one of either the first side or the second side, and at least one of the bubble generators disposed at the other of the first side and the second side, the driving circuit driving the bubble generator(s) disposed at the first side to generate a first bubble in a corresponding chamber and driving the bubble generator(s) disposed at the second side to generate a second bubble in the corresponding chamber; wherein the driving circuit drives the bubble generators selectively so that each of the nozzles is capable of ejecting droplets of different sizes (abstract; figures 6A-6C; column 2, lines 1-46)

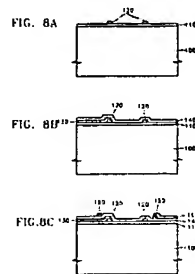


- {claim 9} at least two heaters are disposed at the first side, and each of the nozzles comprises a leading wire for connecting one of the heater(s) disposed at the second side with the heaters disposed at the first side, and the driving circuit applies a voltage on at least one of the heaters disposed at the first side to generate the first bubble and the second bubble simultaneously (figure 6A, reference 120, 150; figure 2, reference 130, 160, 170, 180; column 4, lines 8-47)
- {claim 10} at least two heaters are disposed at the second side, and each of the nozzles comprises a leading wire for connecting one of the heater(s) disposed at

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the first side with the heaters disposed at the second side and the driving circuit applies a voltage on at least one of the heaters disposed at the second side to generate the first bubble and the second bubble simultaneously (as taught in claim 9)

- {claim 11} there is at least one heater disposed at the first side connected in parallel to one of the heater(s) disposed at the second side (column 4, lines 38-43)
- {claim 12} the orifice layer comprises at least two structure layers arranged in parallel, and there is at least one heater disposed on each of the structure layers (figure 8C)



- {claim 13} the droplets are ejected from the orifice along an ejection direction, and at least two of the heaters are disposed on the two structure layers linearly along the ejection direction (figure 8C)
- {claim 18} an interval between the orifice and one of the two bubble generators is different from an interval between the orifice and the other one of the two bubble generators (figure 6A, reference 120, 150)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Lee et al into the invention of Kim et al so that there are at least three bubble generators wherein at least two heaters are disposed on one side; the nozzles comprise a leading wire for connecting the heaters; the orifice layer comprises at least two structure layers arranged in parallel where there is at least one heater disposed on each of the structure layers; and an interval between the orifice and one of the two bubble generators is different from an interval between the orifice and the other one of the two bubble generators. The motivation for the skilled artisan in doing so is to gain the benefit of obtaining a

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bubble-jet type ink jet print head that is easy to manufacture and that can easily produce varying shades of gray by energizing specific ones or a plurality of heaters for each nozzle hole producing ink droplets of varying sizes depending on what combination of heaters are energized (column 1, lines 42-47). The combination naturally suggests that each of the heater(s) disposed at the first side connects in series to one of the heater(s) disposed at the second side and wherein a resistance of the heater disposed at the first side is less than a resistance of the heater disposed at the second side.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Miyamoto et al (US Pat 6536877) discloses a printer, printer head, and method for fabricating printer head formed with a multiplayer wiring pattern.

Lee et al (US PgPub 20020008734 A1) discloses a heater of bubble-jet type ink-jet printhead for gray scale printing and manufacturing method thereof.

Iino (US Pat 4928125) discloses a liquid drop ejection apparatus using a magnetic fluid.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonard S Liang whose telephone number is (703) 305-4754. The examiner can normally be reached on 8:30-5 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Russ Adams can be reached on (703) 308-2847. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

lsl

April 18, 2003


JUDY NGUYEN
PRIMARY EXAMINER